Volume 25 April, 1939 *Number 4*

Lubrication

A Technical Publication Devoted to the Selection and Use of Lubricants

THIS ISSUE

The Mechanized Farm

PUBLISHED BY
THE TEXAS COMPANY
TEXACO PETROLEUM PRODUCTS

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Lubricants for the Gasoline and Kerosine Tractor

ENGINES: . . . . . { HAVOLINE Motor Oil / TEXACO Motor Oil

of S.A.E. grade depending upon engine manufacturers' specifications and temperature conditions.

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In very hot weather or in the event of leakage due to axle clearances, use heavier grades of Texaco Thuban.

NOTE: In very cold weather many manufacturers recommend that Transmission Oil be thinned out with about 25% Motor Oil. If this is done oil should be drained when warm weather returns.

CHAINS, EXPOSED GEARS, AND GEARS not provided with Oil Tight Cases

Below 40°F. . . . . TEXACO Crater Compound No. 0
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When applying TEXACO Crater Compound be sure to clean thoroughly the parts to be lubricated. TEXACO Crater Compound is best applied hot, and with a brush. Chains should be immersed in hot TEXACO Crater Compound when possible.

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(Depending upon whether oil or grease is required) . . . . . { TEXACO Marfak* or / TEXACO Thuban*

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*SEASONAL GRADE:

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Above 40°F. TEXACO Marfak No. 1 . . . TEXACO Thuban 140

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LUBRICATION

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Change of Address: In reporting change of address kindly give both old and new addresses.

The Mechanized Farm

Lubrication of Tractors and Tractor-Operated Equipment

MECHANIZED farming, as distinguished from farming in which work animals supply the motive power, dates back to the latter part of the nineteenth century, when steam traction engines were first introduced. But it made comparatively small progress until the advent of the so-called gas tractor about 1908.

These early tractors were large, slow-moving units, weighing from ten to fifteen tons and costing from two thousand to four thousand dollars. Most of them were employed in custom work. That is, they were purchased and operated largely by contractors who were hired by farmers.

Individual ownership of tractors developed slowly as designers and manufacturers decreased the size and cost of their products, but as late as 1930 they were still too large and too expensive for the average farmer. Only about 1,000,000 out of a total of approximately 6,800,000 farms in the United States were then equipped with tractors.

Next came the developments that were to make mechanized farming possible for even the smallest farmers, i.e., the steel traction wheel and the rubber tire. Today, small, fast-stepping steel-wheeled or rubber-tired units, designed for small acreages, and costing less than comparable animal power, are available, and mechanized farming is now well on its way towards universal use by all farmers.

Paralleling the development of the farm tractor and contributing tremendously to its present-day efficiency and economy, have been the improvements made by refiners of petroleum fuels and lubricants, and by designers of internal combustion engines. With these new fuels and lubricants and modern high powered engines, the tractor of today is leading the way to better living, better farming and greater independence for millions of farmers.

TRACTOR APPLICATION

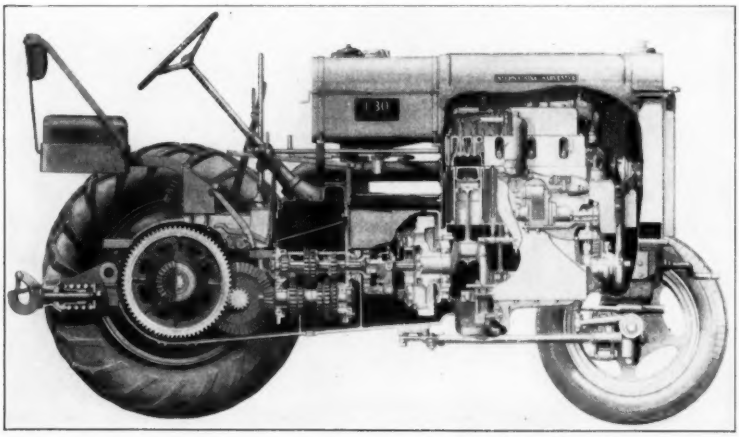
Modern tractors are versatile farm power plants. They deliver power in four useful and convenient forms:

1. Through the drawbar.
2. Through the power take-off.
3. Through the belt pulley.
4. Through mounted implements that become an integral part of the tractor.

Because of its adaptability to practically every farm power job, the tractor of today is well nigh indispensable on the farm. And since proper lubrication is an important factor in successful tractor operation, we are making it the subject of this article. The discussion will be limited to gasoline and kerosine burning engines. Lubrication of the Diesel tractor was discussed in the June, 1938, issue of LUBRICATION.

Servicing his internal combustion engines is an important responsibility for the farmer. Very often he is located so that he must do any ordinary repair jobs himself. It is to his interest, therefore, to keep things running properly; otherwise, his "off time" will be spent in engine repair.

Cooling and lubrication are the chief assistants to proper engine operation. Failure of either will be costly, for considerable time and new materials will usually be required before the engine can be put back into service. There is nothing new about this; it is known to every motor car owner.



Courtesy of International Harvester Company

Fig. 1—The International tractor as equipped for circulating splash lubrication of the engine, and bath lubrication of the gearing.

The farmer, however, does not have a service station handy every half-mile, so he must sometimes carry his lubricants into the fields with his machinery, and often also a supply of water. Creeks or streams are not always a dependable source, for they may carry too much silt or mud after storms or in cattle-grazing areas. In drought, streams also may dry up.

ITS LUBRICATION

To be sure of proper lubrication, the farmer must realize that his engine oils in particular should possess certain distinct characteristics, viz.:

(1) Viscosity and seal-forming properties in line with the operating conditions.
(2) An ability to withstand heat, viz., stability.
(3) Adequate fluidity at low temperatures.

Viscosity

The viscosity of his tractor engine oil is the most important physical characteristic to the farmer. When it is suited to the design and to the operating conditions (according to the engine manufacturers' recommendations), it will assure of:

(1) Free flowing in cold weather, and hence, easy starting;
(2) Sufficient body to resist being squeezed out from between any of the mechanisms where pressures may be relatively high, as for example, in crankshaft, piston pin, and main bearings; and
(3) An ability to maintain a suitable seal between the cylinder walls and piston rings to prevent loss of compression, pumping or blow-by.

Viscosity is an indication of the relative fluidity of an oil at some definite temperature of observation. It is that inherent property which causes the flow of liquids to be retarded; it is possessed by all lubricating oils.

Viscosity can also be regarded as a measure of the resistance which the particles or molecules of an oil will offer to one another as they come into contact in circulation through the lubricating system or between the wearing elements. Viscosity will vary inversely with temperature, so the colder an oil the heavier or more sluggish will it be. In contrast, it will become more and more fluid as the temperature is raised.

Heat Resistance

The extent to which a tractor engine oil will withstand heat is an indication of its stability or resistance to decomposition, its tendency to change viscosity and the possibility of burning to hard carbon. A good tractor oil should be capable of working under the usually high temperatures of operation without any of these occurring to a marked degree.

Pour Test or Fluidity

Low pour test is essential in that it is indicative of the action of the oil in cold weather. The lower the pour test or temperature of relative congealment, the more assurance that a tractor oil will have sufficient fluidity to start and flow readily throughout the oiling system in cold weather. If undue congealment occurs there will be possibility of at least certain of the bearings being more or less under-lubricated, due to faulty operation of the oil pump or imperfect splashing.

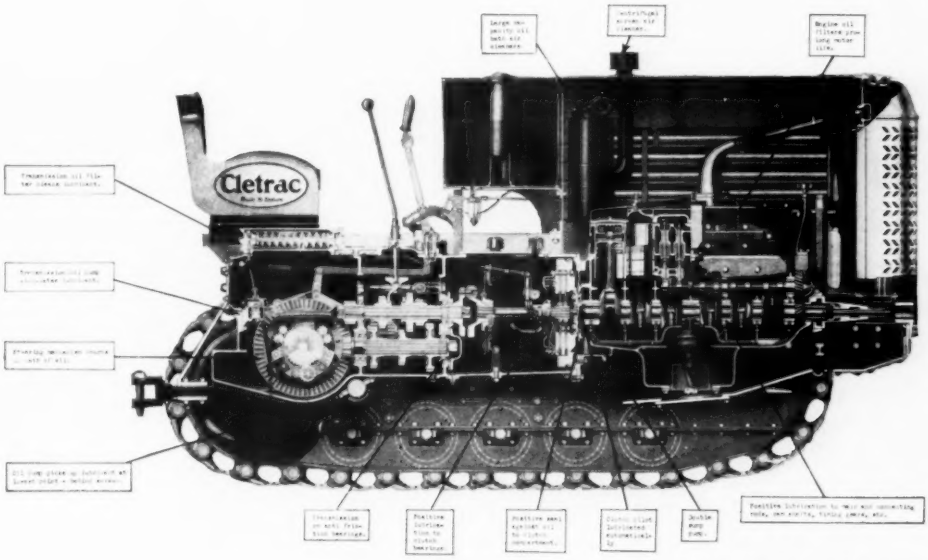
ENGINE LUBRICATING SYSTEMS

Lubrication of the tractor engine is similar to that of the automobile engine. So the modern tractor engine employs circulating full pressure, force feed or splash oiling systems, according to the type and power requirements.

Circulating systems involve continued usage of the oil in the crankcase over the life of the particular oil. All the while a sufficient amount of oil is delivered to all moving parts when the engine is running and no oil is wasted or discarded until its lubricating value has been so reduced as to render this advisable. In full pressure lubrication, the oil is circulated by a suitable pump (usually of the geared type), which is located in the oil reservoir.

Splash lubrication by oil from the reservoir in the crankcase is a somewhat simpler means of bringing about effective lubrication of engine parts, the oil circulating back to the reservoir by gravity for re-usage. A combination of both is also practicable.

This oil should be changed every 40 to 60 hours when using gasoline or Diesel fuel; and every 30 to 40 hours when using kerosine.



Courtesy of The Cleveland Tractor Company

Fig. 2—Cross section of the Cletrac Crawler tractor showing details pertinent to lubrication.

OPERATING CONDITIONS

The development of tractor engine lubrication has been influenced by the wide variety of operating conditions, to which the average tractor may be subjected.

It is especially essential that one know in advance, when selecting an oil for a particular type of lubricating system, just how the oil will act, not only on starting, especially in cold weather, but also the degree to which it will lend itself to complete circulation and maintenance of a protective film between the wearing elements, when subjected to the bearing pressures developed during actual operation. Ease in starting involves both the viscosity and the pour test.

Whenever an oil is too heavy in body, or of too high a pour test under low temperature conditions, it may not pump readily throughout the system. There may also be the possibility of congealment within the bearing clearances and on the cylinder walls. This will lead to hard starting.

As a result, both the pour test and the viscosity should be carefully studied at the starting and operating temperatures. It is evident that a tractor oil must possess these characteristics to the proper extent, otherwise, it may be unsatisfactory for the duty involved.

The viscosity or body of an oil is also of considerable importance where a tractor must function in warm weather or under intensive operating conditions. The viscosity will have an effect upon oil consumption. To realize this, it is essential to appreciate that lubrication requires the development and maintenance of a suitable film of oil on the cylinder walls and within the clearance space of all the bearings at the temperature of operation. Under normal draw-bar conditions, these latter will not exceed 300 degrees Fahr.

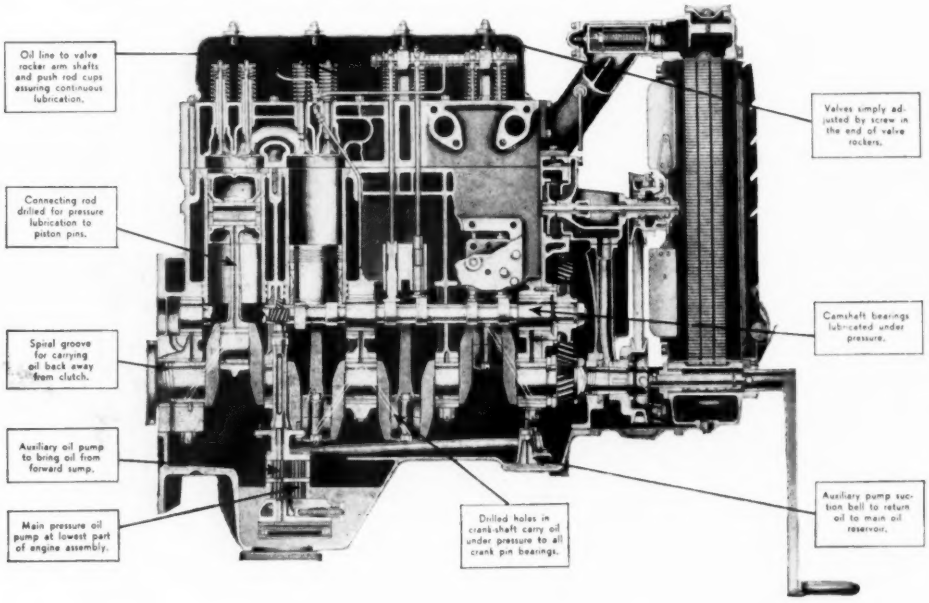
When a tractor is used for threshing, however, it is stationary. Here the cooling capacity of the radiator may be somewhat lower than where the machine is in motion. As a result, higher engine temperatures may develop. While these latter may improve combustion of the fuel, they will also impose a more severe

load upon the lubricating film. It is the duty of the oil refiner to select his crude stocks and methods of refinement to assure of no interruption of the lubricating film under such conditions.

The Influence of High Temperatures

High engine temperatures increase the fluidity of the engine oil. This will be most apparent in warm weather, when the amount of external cooling will be appreciably lower than in cold weather, or when the tractor is serving as the combustion engine. It is only a detriment, however, in the form of soot or deposits of carbonaceous tarry matter, which may result from vaporization or actual chemical breakdown of the oil.

Material of this nature may markedly affect the operation of the engine. Power reduction and "knocking" (according to the extent to which deposits are formed on the spark plugs, pistons, cylinder heads, around the rings, on valves and valve seats) will be evidence of carbon deposits.



Courtesy of Caterpillar Tractor Company

Fig. 3—The Caterpillar tractor engine. A feature of this engine is that the oil pump is always immersed, regardless of the operating angle, so full pressure lubrication is assured.

driving element for stationary machinery, such as the threshing-machine or ensilage cutter.

The utmost care must, therefore, be taken in the selection of the proper grade of tractor oil for warm weather operation. Haphazard choice may result in too great a reduction in the fluidity of the oil in service. This may result in poor lubrication of certain of the wearing parts of the engine, as well as increase in the rate of oil consumption. The ultimate occurrence of scored or burned out bearings, or abnormal wear on cylinder walls, and an excess of oil pumping past the piston rings will all lead to increased cost in maintenance and a natural decrease in power output.

The Effect of Carbon Residue

Heat also controls the rate of carbon deposition. Petroleum products are hydrocarbons; as a result, carbon in some chemical form must be continually passing through every internal

Heat and Base of Crude

The amount of carbon residue developed will depend entirely upon the degree of heat present, the extent of refinement* of the lubricant and the crude from which it is made. Some types of crude oil will produce distillates which will show an almost negligible carbon residue, 0.05 per cent being a fair idea of the amount to be expected. Blending with residual oils, however, to increase the viscosity, may raise the carbon residue percentage of the resultant product to 1.0 per cent or above.

Carbon which is developed from blended oils containing residual products will be harder and more abrasive than carbon residue from lubricants of equal viscosity, but which are wholly of a distilled nature. Hard abrasive carbon does its greatest damage as a promoter of wear on cylinder walls and bearings. Very frequently

* Methods of refinement were discussed in "LUBRICATION" for February, 1939.

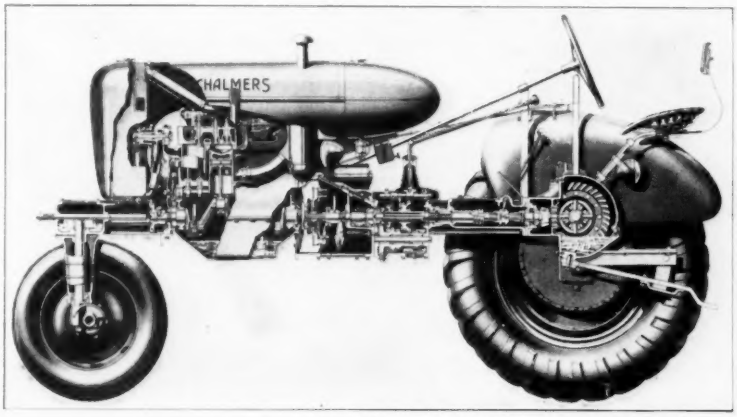
it will be developed on the upper part of the cylinder walls to be retained by the lubricating film and ultimately work past the piston rings and into the lubricating system.

All true carbonaceous deposits in the average automotive engine do not, of course, originate from the lubricating oil. When formed in the combustion chamber or around the piston rings, they may be due to incomplete combustion of the fuel, improper fuel, low ignition temperatures or faulty ignition.

Carbon deposits around the piston rings are always most objectionable as free motion of the latter is affected to cause blow-by, oil pumping, loss of power and increased oil consumption.

How extensive these deposits may be will, of course, depend upon the residual carbon content of the oil. Where the latter burns cleanly the amount of such deposits will be relatively small. Furthermore, if the oil is properly refined and adapted to the purpose, such carbonaceous matter will be soft in appearance, low in quantity and easily removed when cleaning is necessary. Over extended periods of operating, however, carbon deposits, whatever their nature, will be bound to increase. This is one of the reasons why engine builders recommend regular changing of oil.

Engine deposits are also influenced by the dust in the air. The farm tractor operates so often in a cloud of dust that regular cleaning of the air filter, is most important. If it is not serviced according to the engine builders' recommendations, serious difficulty from deposits may result.

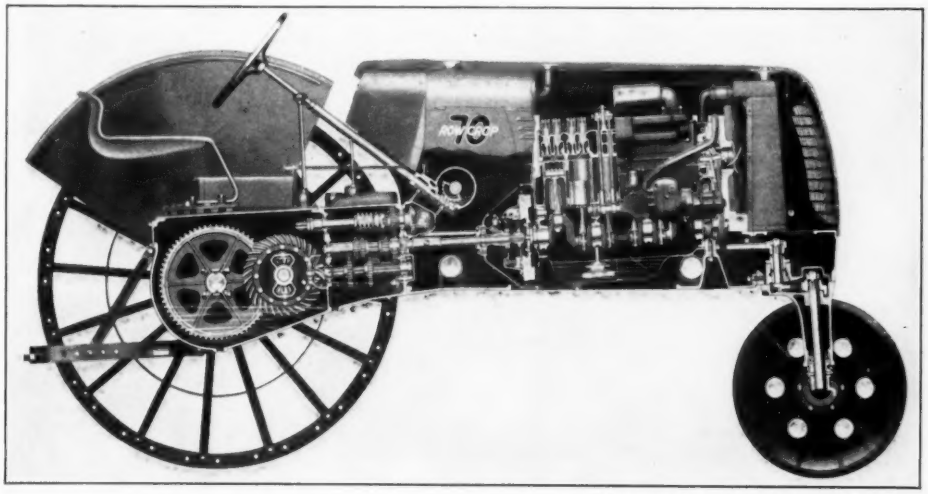


Courtesy of Allis-Chalmers Manufacturing Company

Fig. 4—The Allis-Chalmers Model "WC" tractor showing engine and gear details. The engine is pressure lubricated; the gears by splash.

Excess Lubricating Oil Also a Detriment

In time, the use of excessive amounts of lubricating oil will also lead to carbon deposits. Theoretically, but a very small amount of oil is necessary to maintain the requisite lubricating film on the cylinder walls and serve the respective bearings; actually, however, a considerable excess of oil will be used. Where the rings give the proper degree of seal and the cylinder walls are not abnormally worn, but

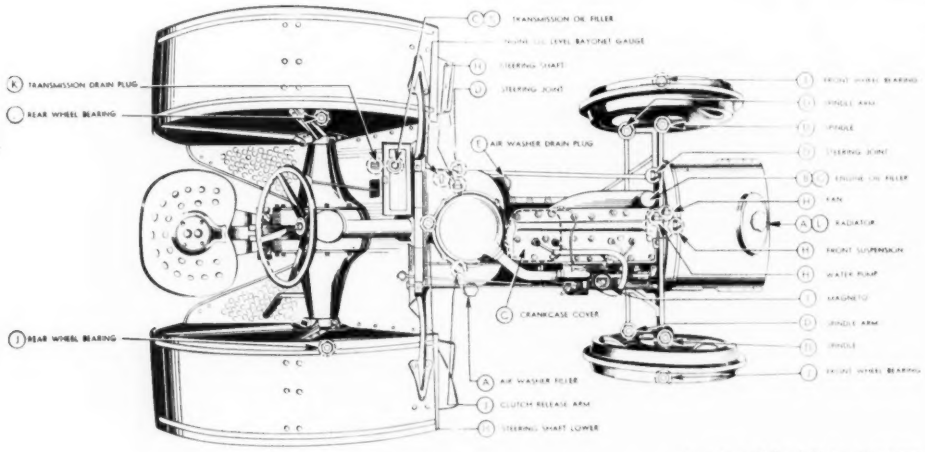


Courtesy of Oliver Farm Equipment Company

Fig. 5—The Oliver "Row Crop 70" tractor. This has a pressure oiled engine, splash-lubricated gears, and makes considerable use of ball and roller bearings.

little of this oil should pass to the combustion chamber. If the oil level is carried too high, however, especially in oiling systems involving splash lubrication, the amount of oil may be of either the sleeve or anti-friction type.

When the tractor is in motion the service on both gears and bearings is very severe, so a



Courtesy of Ford Motor Company

Fig. 6—Lubrication chart for the Fordson tractor: *Twice daily in the morning and after lunch*—(A) fill with fresh clean water; (B) fill to "F" mark on bayonet gage with oil of correct grade; (C) fill to level of filler hole with gear oil of correct grade. *Daily*—(D) grease with grease gun; (E) empty and flush with water until it comes out clean; (F) cover tractor to protect it from the weather. *After every 50 hours running*—(G) change engine oil, remove crankcase cover, clean cover and screen in gasoline, reassemble and refill with oil of correct grade, wash oil filler cap in gasoline and re-oil filter; (H) grease with grease gun; (I) apply two or three drops of oil. *After every 100 hours running*—(J) grease with grease gun. *After every 500 hours running*—(K) drain, flush with engine oil and refill with correct grade of gear oil; (L) drain and flush until water comes out clear.

on the cylinder walls may be so excessive that a certain percentage cannot help but find its way into the combustion chamber. A smoky appearance of the exhaust will frequently indicate that this is occurring.

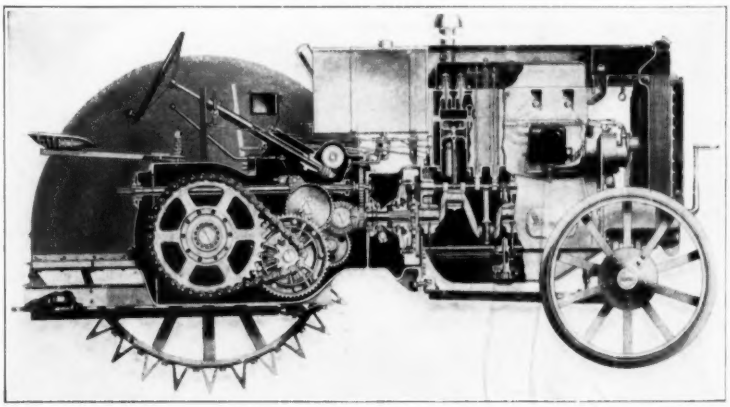
POWER TRANSMISSION GEARING

The transmission of power from the engine to the rear axle and wheels requires certain speed change and reduction gears in the tractor just as in the automobile. The transmission is set between the engine and the differential, or final drive. These assemblies along with the steering mechanism are normally located in the same oil tight housing and served by the same lubricant through bath lubrication activated by pump or splash. In the transmission spur gears predominate. The final drive or differential, however, may use worm, spur or bevel gears.

Transmission and rear axle lubrication is essentially a matter of combined gear and bearing lubrication, wherein the lubricant must serve a dual purpose. The bearings, in turn may be of either the sleeve or anti-friction type.

When the tractor is in motion the service on both gears and bearings is very severe, so a lubricant must be used of just the right viscosity or body to not only insure adequate penetration throughout all the bearing clearances and maintenance of the requisite oil film with a minimum of internal friction, but also protection of the gear teeth from wear to reduce noise during operation.

There is, of course, a certain amount of latitude relative to the viscosity or body of the lubricant which should be used in any assembly of this type. The controlling elements are the type of bearings and constructional conditions.



Courtesy of J. I. Case Company

Fig. 7—Sectional view of the Case Model "L" tractor showing oil lines for pressure oiling of the engine. Note unique arrangement of gear and chain assembly.

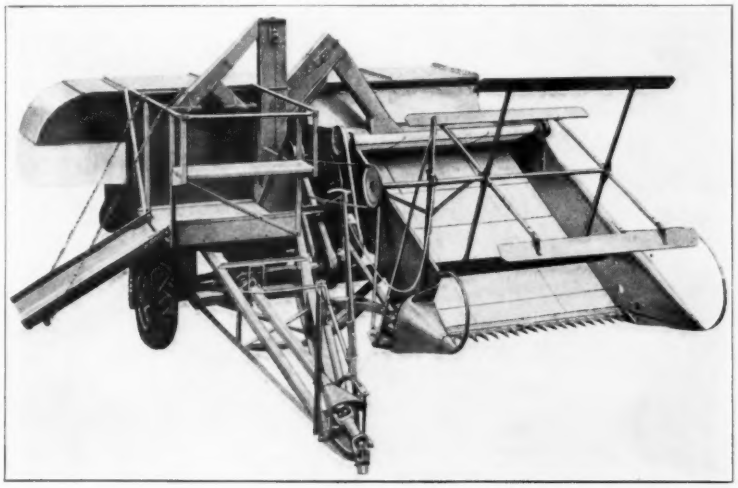
Where installations are equipped with anti-friction bearings on the gear shafts a straight mineral gear oil within the S.A.E. 80 range will usually be suitable.

Others, wherein similar bearings are used, but so located that individual lubrication is possible, will frequently require grease lubrication of the bearings, the gears in turn being served by a straight mineral gear lubricant within the S.A.E. 90 to 140 range.

Still other installations, on account of design, wear or arrangement of gears, may require an even heavier lubricant, say an S.A.E. 250.

Oil Level Control

The gear case should never contain more than just enough lubricant to insure that the teeth of all gears on the lowest shaft of the transmission dip in the lubricant. This will promote most effective lubrication; any higher level will impose a "drag" on the gears, especially in cold weather. Where slow motion is involved, however, some authorities disregard "drag" and recommend that the level of the lubricant be raised until certain of the higher gears are submerged. The oil level should be inspected at regular intervals and fresh oil added when the machine is warm. When re-lubrication is necessary the oil should be poured in to a pre-determined level. Regular draining according to the manufacturers recommendations is also advisable.

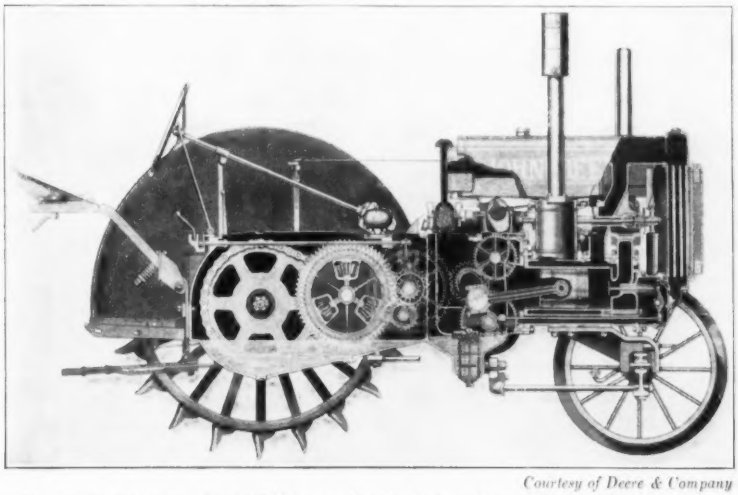


Courtesy of Allis-Chalmers Manufacturing Company

Fig. 9—An Allis-Chalmers All-Crop Harvester.

Importance of Fluidity

The pour test of any gear lubricant is especially important when the tractor is to be used in cold weather. Even a properly filled gear case is not dependable if the gear lubricant therein has not a sufficiently low pour test to remain comparatively fluid under low temperature operation. In such an event the gears would channel through it, and any lubricant sticking to the sides of the case would not flow readily back to the bottom. The evident precaution is to select a gear lubricant which will have adequate fluidity at the lowest operating temperature which will probably be encountered in cold weather.



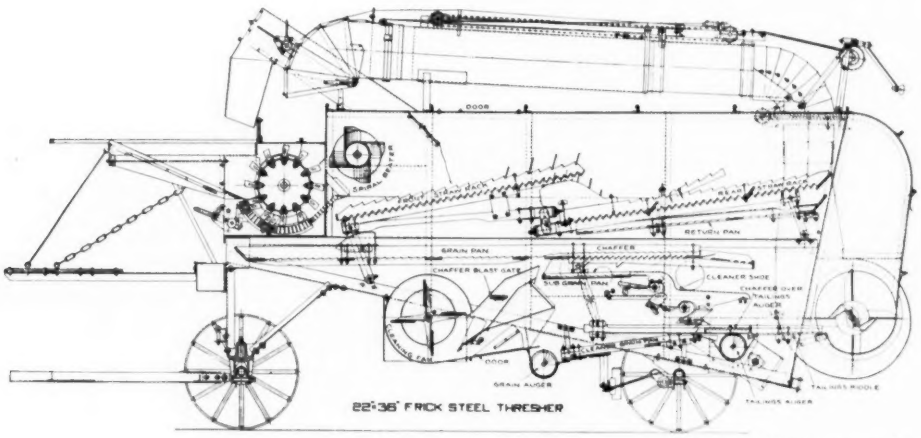
Courtesy of Deere & Company

Fig. 8—The John Deere Model "D" tractor showing horizontal two-cylinder engine arrangement, the gear and drive chain assemblies, and oil levels in the respective cases. The engine is pressure oiled; the other parts operate in a bath of lubricant.

Chain Drives

In tractors where chains are employed the tightness of the case should dictate how heavy the lubricant should be. Wherever gears or chains are exposed, it is necessary to use a gear lubricant of considerably higher viscosity to assure of retention, resistance to being thrown off by centrifugal force, and to take up the shock and strain so often incurred.

In driving chain lubrication, the lubricant must serve as a lubricant and as a protective agent. The wearing parts should, therefore, be regularly immersed to insure penetration of the lubricant to the innermost elements. In lubricating any chain designed for exposed service, one should use a straight mineral lubricant having a viscosity of from 500 to 1000 seconds Saybolt at 210 degrees Fahr. The general procedure in chain lubrication should be to remove, wash in kerosine, immerse in the new lubricant, then hang up to cool and drain off any excess.



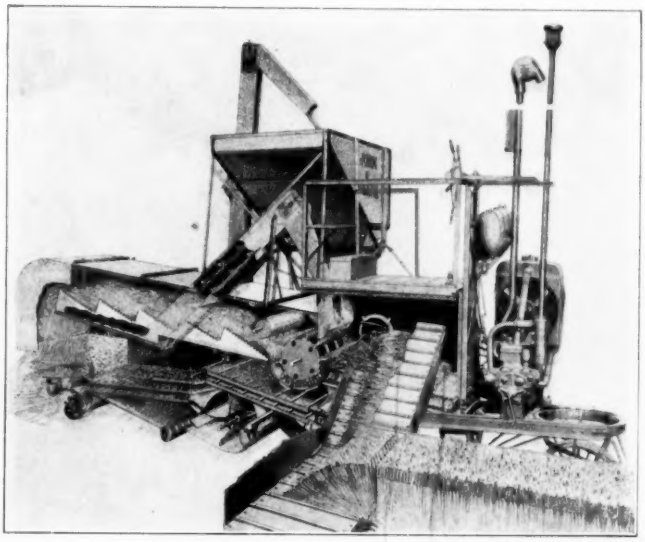
Courtesy of Frick Company, Inc.

Fig. 10—Details of a Frick Steel Thresher showing the mechanisms for handling straw, chaff and grain. Pressure lubrication is a feature; likewise, the use of ball and roller bearings to aid in reducing power requirements.

DRAW BAR SERVICE

Draw bar equipment operates at the same speed as that of the tractor. Normally this requires but few parts to turn over more than about a hundred revolutions per minute. So lubrication is not subjected to any severe speed conditions. We must, however, consider exposure and, very often, load when servicing machines such as plows, harrows, seeders, combines, corn pickers and binders; as a result, many of the bearings, chains and gears will tend to accumulate dust and dirt, which will very soon bring about abnormal wear unless they are frequently cleaned and supplied with fresh lubricant. In addition, rain will tend to wash lighter lubricants from the bearings.

As a result of these conditions, modern power farming machinery is being more and more equipped with pressure gun grease fittings and anti-friction bearings. Some, however, still must be oiled by hand or through oil cups. These should always be cleaned out as completely as possible before each oiling or else carefully capped to prevent entry of dirt. Where oil cups are installed or hand lubrication is necessary, an S.A.E. 30 engine oil will usually be suitable. Where grease lubrication is called for, a medium bodied pressure gun grease will give the most satisfactory service.



Courtesy of Deere & Company

Fig. 11—The John Deere No. 7 combine showing grain cutting, its travel past the cylinder, the disposal of chaff, straw and tailings, and final recovery of clean grain into the hopper. Pressure gun lubrication is provided for to all anti-friction bearings and other important parts.

Wherever gears and chains are exposed, the nature of their service and their continual operation in the presence of dirt, dust, chaff and straw, renders satisfactory lubrication

a practical impossibility. As a general rule, were a suitable gear and chain lubricant applied, it would not serve its intended purpose due to the fact that there would often be such an accumulation of foreign matter that excessive power would be required to operate the machine, or the chains might even be thrown from the sprockets in extreme cases. For this reason, chains are often run dry unless each respective roller can be readily oiled through specially drilled oil holes.

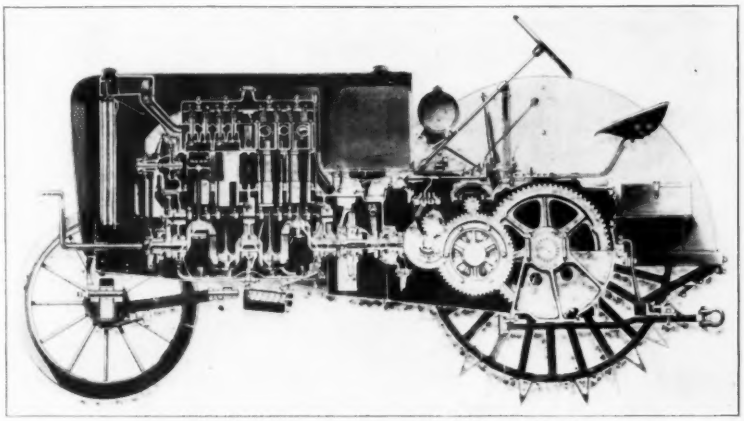
On smaller exposed gears which mesh directly, it is usually satisfactory and most economical to use the same grade of engine oil as recommended for bearings. This will be of sufficiently low viscosity to resist accumulations of foreign matter to any great extent, and it may be readily applied with an oil can when other parts of the machine are lubricated.

When such gears are enclosed in a relatively tight gear case, a fairly heavy gear lubricant of about 1000 seconds Saybolt viscosity at 210 degrees Fahr., will be satisfactory.

BELT-DRIVEN MACHINERY

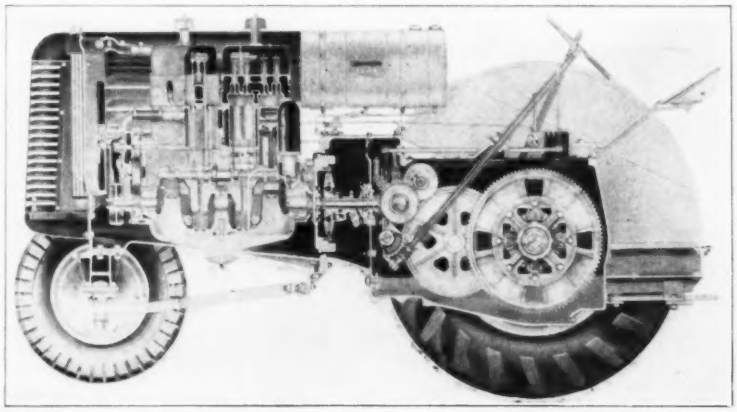
The Threshing Machine and Combine

Lubrication of the threshing machine is usually regarded as one of the most important phases of farm machinery upkeep, due to the dependence which is placed on this unit during the threshing season. Any delay in operation traceable to improper lubrication, such as the occurrence of scored or burned out bearings, may frequently set back the entire working schedule. This may not only affect the net yield of the grain crop but also the planting of the next crop, especially where winter wheat is a feature. As a result, the selection and application of suitable thresher lubricants should never be slighted.



Courtesy of The Massey-Harris Company

Fig. 13—The Massey-Harris "25" tractor. The engine is pressure oiled, the gears operating in a bath of lubricant.



Courtesy of Minneapolis-Moline Power Implement Company

Fig. 12—The Minneapolis-Moline Model "GT" plow tractor showing details of the pressure lubricated engine and assembly of the transmission, final drive and steering gearing.

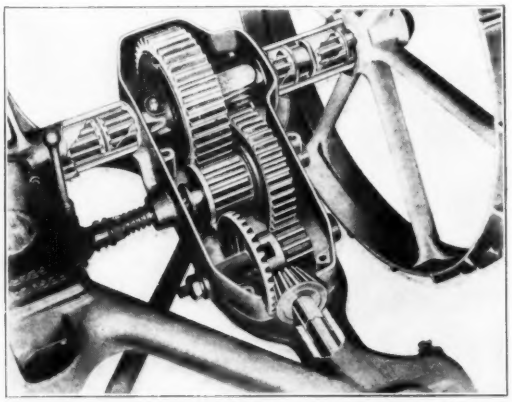
Threshing machines today embody a high speed cylinder shaft and a variety of other bearings, belts, chains and pulleys. Motive power is applied to all these operating mechanisms by flexible belt connections either directly or indirectly from the tractor engine.

On some parts of equipment such as hay loader cranks, disk-harrow axles and thresher feeder cranks, etc., where duty is not too severe and adequate reservoirs are impractical or too expensive, wood bearings have oftentimes been used. Such bearings are usually oiled by hand and inasmuch as they are porous to a certain extent they tend to decrease shaft wear.

The thresher, like all other such equipment, often operates under adverse conditions, so the bearings are constantly subject to high pressures and to dust, dirt, chaff and the likelihood of being exposed to rain. For this reason, only high grade lubricants should be used in order to insure as much protection as possible. Often the life of a thresher and its ease and

efficiency of operation will be governed by its lubrication.

The cylinder shaft bearing is the most important single element. The cylinder speed will vary from 850 to 1400 r.p.m.; according to the diameter and travel speed. A fair average is around 1100 r.p.m. The cylinder is the highest speed unit on the thresher. To assure of dependable operation, it is carried on ball bearings. The use of these latter prevents end play and reduces the possibility of cracked grain. The tapered roller bearing, in turn, is used on the wind stacker fan; cylindrical rollers are adapted to the feeder, beater, shaker shaft, cleaning fan and wheels.



Courtesy of International Harvester Company

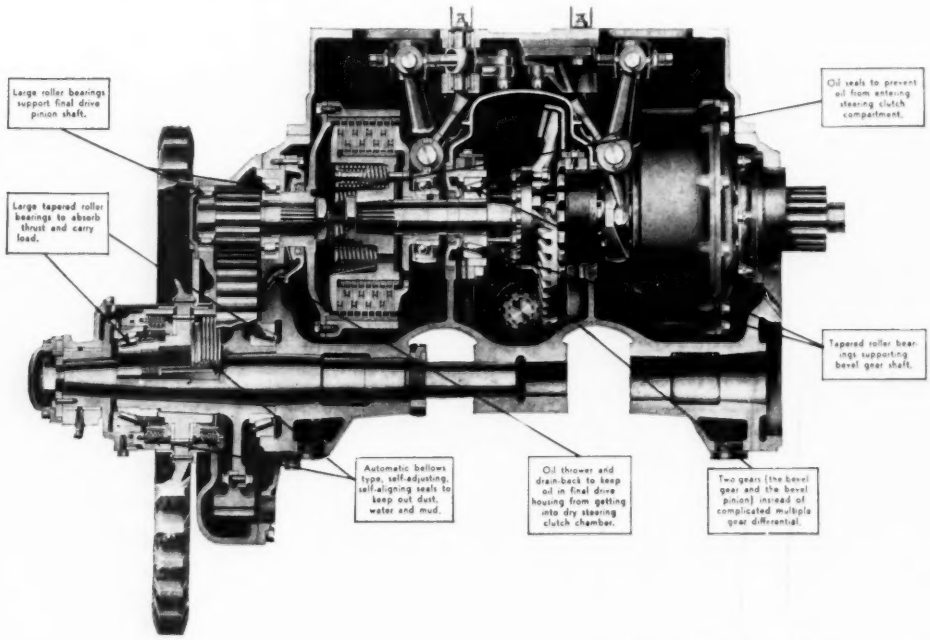
Fig. 14—Gear and wheel bearing assembly of an International tractor showing manner of housing to protect lubrication.

This wide application of anti-friction bearings has led to virtual standardization of pressure grease lubrication and the use of a selected bearing lubricant.

Some hand oiling must, of course, also be done on minor parts. So oil holes are often provided. These must always be picked free from dust by the operator prior to oiling (unless they are provided with a hinged cover). This method of lubrication, however, is never as dependable as some form of enclosed oil cup. For such parts, an S.A.E. 30 engine oil will usually be suitable.

Guard Against Inferior Lubricants

Cheap compounds of a relatively light mineral oil and some form of poorly refined vegetable oil are sometimes offered the farmer as substitutes for the better-known branded lubricants. The mineral constituent of most inferior lubricants will be so light, as a rule, as to have considerable tendency toward evaporation, especially at the shaft ends where exposed to the air, with the result that the remaining lubricant will gum, oxidize and dry out, to probably cause overheated bearings and an increase in power consumption.



Courtesy of Caterpillar Tractor Company

Fig. 15—The Caterpillar final drive. Note remarks pertinent to lubrication and the self-lubricating seals which are so helpful in protecting lubrication against contamination or loss of oil.

Gears and Chains

There are a certain number of gears, sprockets and chains involved on the thresher, the lubrication of which is frequently a source of discussion. As a rule, these are run dry, due to the excess of dust, dirt and straw that will always be present. Such chains usually consist either of stamped steel or malleable iron links without rollers or pins. The application of a gear lubricant would in all probability cause straw, dirt and dust to accumulate to such an extent as to hamper the operation of the chains, or even throw them off the sprockets. If desired, however, chains may be removed periodically, cleaned thoroughly in kerosine, dried and dipped in warm lubricating oil. This is an effective means of lubrication, provided the chains are drained prior to replacement on the sprockets.

Cylinder Balance

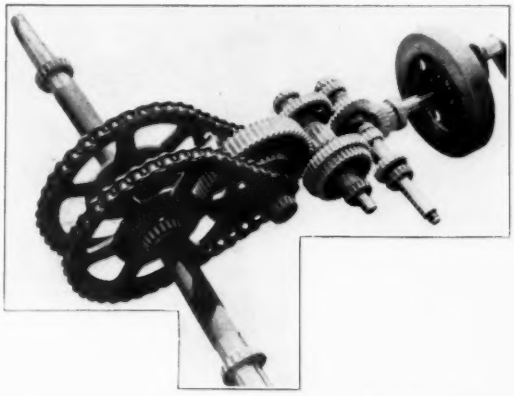
In thresher operation, it is essential to maintain the revolving threshing cylinder in practically perfect balance at all times. Otherwise, considerable vibration and pounding will occur which will tend to cause flat journals, worn and overheated bearings and increased power consumption. The ball bearing obviates this to a considerable degree. Should the bearing become damaged, it will occur, however, and it cannot be remedied by using a heavier grade of lubricant, although the detrimental results will be somewhat minimized. The only solution is to perhaps renew the bearings and balance the cylinder carefully by removing it from the thresher and testing with the journals supported by horizontal knives or straight edges. According as the cylinder rolls on its supports with the tendency of the heavier parts to turn downward, the lighter side can be weighted to bring back the balance as necessary. The other reasons for a cylinder being out of balance are the wearing of teeth or the renewal of others irregularly without regard to the distribution of weight.

Overheated Bearings

Overheating of stacker fan bearings and belt tightener bearings of the plain babbitted type is oftentimes encountered and seemingly impossible of being overcome by increasing the rate of lubrication. In such cases, the tightness of the driving belt is usually the cause. An abnormally tight belt will usually cause such bearings to run hot. However, this is no reason for running with a belt so loose as to cause slipping. Judgment in regulating the tightener pulley and regular attention to lubricating equipment will prove the best insurance against such a condition.

Miscellaneous Belt-Driven Equipment

Here we will have to deal with the ensilage cutter, corn husker, power saw and lighting set, etc. Operating conditions are practically the same, and mechanisms such as bearings, chain and sprocket drives, small gears and belts are usually all we will have to deal with.



Courtesy of J. I. Case Company

Fig. 16—The Case tractor transmission from the fly-wheel to the rear axle.

Grease cup lubrication is preferred by the builders of such machines wherever positive lubrication is required, although hand-oiling is also necessary.

On all such equipment the lubricant will depend upon the means provided for application. For grease cup or pressure gun service a medium bodied product should be used. Where oil is required, an S.A.E. 30 engine oil will be suitable.

It will generally be found most satisfactory on such machines, as on other power farming equipment, to run chains and sprockets dry. The reason for this has already been mentioned. On the other hand, it will often be possible and beneficial to remove chains frequently and clean and dip them in oil as explained above. Small gears can be lubricated with the same engine oil or gear compound as used elsewhere on the farm.

GREASE LUBRICATION

Methods of lubricant application must be fully understood if the owner of any type of power farming machinery is to enjoy economical operation and low maintenance costs. The "axle grease" day with its attendant sloppiness has passed; less of the right kind of lubricant is far better protection than an excess of an inferior product. Furthermore, it is cleaner and less costly.

For this reason, the builders of farm machinery are using more ball and roller bearings and better means for protecting gears and

chains. Tractor builders have, of course, pioneered this move for the engine had to be protected from the very beginning. Later, they too saw the wisdom of the covered gear, the enclosed chain and pressure gun lubrication of sleeve type and anti-friction bearings. So today we find these latter on tractor wheels, front axle and steering assemblies, rear axle countershafts and bull pinion shafts. These assemblies can be well housed and when lubricated regularly by pressure gun and a high quality grease, their protection is assured.

The pressure gun, however, can be badly misused. Then it serves to defeat the purpose for which it is provided. Obviously this purpose is to charge a bearing with clean, pure grease. To assure of this, all grease containers should be kept covered and guns should be refilled under cleanly conditions. Later they should be stored under the same conditions.

The use of grease as a lubricant on the modern farm implement can be likened to chassis lubrication on the automobile. It is becoming more and more customary to provide these parts with means of pressure grease lubrication by use of a hand or power gun, although compression grease cups, of course, are still used; as for example, on the hay baler.

All such elements must be properly lubricated if the machine is to function as an efficient unit. The requirements involved in a grease for such service are not so exacting as in the case of engine oils. On the other hand, one should not go to the extreme in the belief that any cheap grease will suffice.

Adequate protection will be attained if the essential characteristics of a grease, such as its melting point, consistency and the nature of the soap from which it has been made are studied in connection with the operating conditions.

As a general rule, some of the bearings will be exposed at the ends, allowing for a complete flow of grease through the clearance spaces. If the grease is of the proper consistency to remain in position at such points a protective collar will be developed which will very effectively prevent entry of dust or dirt into the adjacent bearing spaces.

Consistency

In the petroleum industry, consistency is regarded as indicative of the body or degree of hardness of the grease. It also serves as an indication of the texture. For example, cup greases will usually have a short fibery or buttery consistency, whereas a sponge grease will have a long fibery or spongy consistency. They will vary in hardness, however, according to the amount and nature of soap used in their manufacture, as well as the method employed.

Melting Point

The melting point of a grease is indicative of the extent to which it will stand high temperatures. If bearing temperatures should run comparatively high, the melting point of any grease to be used under such conditions should be sufficiently above the average temperature to insure against reduction of body and the possibility of separation of the soap from the oil. Most cup greases cannot be heated very much above their melting point without the danger of such separation occurring.

So it is well to remember that the melting point of a grease is controlled by:

1. The nature of the fatty oil used,
2. The nature of the base, and
3. The percentage of soap.

The nature of the alkali used, i.e., whether it is lime, soda or other such material, influences the melting point more than do the other factors. In general, lime soap greases are of comparatively low melting point, whereas soda soap products will have fairly high melting points.

Pressure Lubrication

Lubrication by means of the grease gun requires the use of some form of fitting or nipple equipped with a ball check valve to insure retention of the lubricant. By constructing the exterior of this fitting to conform with the design of the discharge nozzle of the pressure gun, it is practicable to render lubrication virtually automatic and absolutely controllable upon attachment of the compressor or power lubricator.

Pressure lubrication is comparatively simple for it facilitates the handling of grease in a cleanly and expedient manner. It furthermore enables the ready forcing out of deteriorated, contaminated or gummed grease, which otherwise would be a decided hindrance to effective lubrication. This is, in fact, one of the essential advantages of pressure grease lubrication.

Sealing

Sealing is a most important feature in modern farm equipment design. In the tractor it protects the wheel bearings, track rollers and gear mechanisms. On draw-bar implements and the thresher it assures that anti-friction bearings and many of the gears will be free from abrasive dusts. All in the interest of greater durability and better lubrication.

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TEXACO Lubrication Recommendations for Tractors

	Atmospheric Temp. °F.	Caterpillar Model: RD-4, RD-6, RD-7, RD-8, D-2, D-4, D-6, D-7, D-8	Cletrac Model: AD, BD, CD, DD, ED, FD	International Harvester Model: TD-18, TD-35, TD-40, WD-40, ID-40
CRANKCASE OIL	Above 75	TEXACO Ursa X-30	TEXACO Ursa Oil	TEXACO Algol Oil
	32-75	TEXACO Ursa X-20	TEXACO Algol Oil	TEXACO Algol Oil
	10-32	TEXACO Ursa X-20	TEXACO Algol Oil	HAVOLINE Motor Oil-20
	Below 10	TEXACO Ursa X-10	TEXACO Alcaid Oil	HAVOLINE Motor Oil-10
AIR CLEANER	Above 32	HAVOLINE Motor Oil-20	HAVOLINE Motor Oil-20	HAVOLINE Motor Oil-20
	Below 32	HAVOLINE Motor Oil-10	HAVOLINE Motor Oil-10	HAVOLINE Motor Oil-20
FUEL INJECTION PUMP		HAVOLINE Motor Oil-20	HAVOLINE Motor Oil-20	HAVOLINE Motor Oil-20
FAN—Oil Type		. . . . .	Crankcase Oil	TEXACO Thuban-90 or 140
—Grease Type		TEXACO Marfak No. 1	TEXACO Marfak No. 2	. . . . .
WATER PUMP—Oil Type		. . . . .	Crankcase Oil	TEXACO Thuban-90 or 140
—Grease Type		. . . . .	TEXACO Water Pump Grease	. . . . .
MAGNETO		HAVOLINE Motor Oil-10	HAVOLINE Motor Oil-20	TEXACO Home Lubricant
STARTING MOTOR		HAVOLINE Motor Oil-20	HAVOLINE Motor Oil-20	. . . . .
GENERATOR		. . . . .	HAVOLINE Motor Oil-20	. . . . .
TRANSMISSION, DIFFERENTIAL, FINAL DRIVE	Above 70	TEXACO Thuban-140	HAVOLINE Motor Oil-60	TEXACO Thuban-140
	32-70	TEXACO Thuban-140	HAVOLINE Motor Oil-40	TEXACO Thuban-140
	Below 32	TEXACO Thuban-90	HAVOLINE Motor Oil-30	TEXACO Thuban-90
TRACK SYSTEM	Above 70	TEXACO Thuban-250	HAVOLINE Motor Oil-60	TEXACO Thuban-140
	32-70	TEXACO Thuban-140	HAVOLINE Motor Oil-40	TEXACO Thuban-140
	Below 32	TEXACO Thuban-90	HAVOLINE Motor Oil-20	TEXACO Thuban-90
WHEEL OR SPROCKET BEARINGS		TEXACO Marfak No. 0 or 1	Track System Oil	TEXACO Thuban-90 or 140
CLUTCH BEARINGS		HAVOLINE Motor Oil-20	TEXACO Marfak No. 2	TEXACO Thuban-90 or 140
STEERING MECHANISM		. . . . .	. . . . .	TEXACO Thuban-90 or 140

NOTE: When two entries are listed, use light grade in winter, heavy grade in summer.

TEXACO
REG. T.M.

LUBRICATION OF POWER FARMING MACHINERY

Draw-Bar Equipment

Gang Plows • Disk and Tooth Harrows • Cultivators • Planters, Drills and Seeders • Manure Spreaders • Grain Binders • Grain Headers • Reapers • Harvester-Thresher Rigs • Hay Loaders and Stackers • Hay Tedders • Corn Pickers and Binders, Etc.

BEARINGS

Oil Cup or Hand Lubrication
TEXACO Motor Oils

Grease Lubrication
TEXACO Marfaks or
TEXACO 919 Lubricant S

GEARS

When Enclosed
TEXACO Motor Oils are used in engine, or
TEXACO Thubans

When Exposed
TEXACO Crater Compounds

Belt-Driven Machinery

Threshing Machines • Corn Huskers and Shredders • Ensilage Cutters • Saw Milling Machines • Pumps • Lighting Sets, Etc.

BEARINGS

Force Feed Lubricators, Chain Oilers, Oil Cups, Wick Feeds and Hand Lubrication
TEXACO Motor Oil

Grease Lubrication
TEXACO Marfaks or
TEXACO 919 Lubricant S

Ball and Roller Bearings
TEXACO Starfak Greases

CHAINS

Where Lubrication is deemed advisable, Clean, Dry and Dip in
TEXACO Motor Oils or
TEXACO Thubans

GEARS

When Enclosed
TEXACO Motor Oils or
TEXACO Thubans

When Exposed
TEXACO Crater Compounds

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